Air Quality Monitoring in Sherwood Park
Fall, 1996 (September 6, October 18, October 22 and October 28)

Alberta Environmental Protection is currently conducting an air quality monitoring program in Strathcona County. The objectives of this program are to: (1) determine air quality parameter concentrations in the community of Sherwood Park relative to air quality guidelines and to other small urban locations in the province; and (2) determine the concentrations of specific chemical species in the Strathcona industrial area and at upwind and downwind locations from the industrial area. The program began in the summer of 1996 and is expected to be completed by mid-summer of 1997.

Air quality was measured using a mobile monitoring unit at five locations in northwest (Sioux Road), southwest (Victoria Way), central (Festival Place), northcentral (RCMP Headquarters) and east (Heritage Hills) Sherwood Park. Air quality parameters monitored at these locations included carbon monoxide (CO), ozone (O_3), total hydrocarbons (THC), reactive hydrocarbons (RHC), methane (CH_4), total oxides of nitrogen (NO_x), nitrogen dioxide (NO_2), nitric oxide (NO), hydrogen sulphide (H_2S), total reduced sulphur (TRS) and sulphur dioxide (SO_2).

The following is a summary of the results of the mobile air quality monitoring activities in Sherwood Park during the fall of 1996 (September 6, October 18, October 22 and October 28). Additional chemicals monitored using integrated techniques (volatile organic compounds and polycyclic aromatic hydrocarbons collected as a 24-hour sample) will be reported after the monitoring program is complete.

Major Findings

- Concentrations of all air quality parameters monitored in Sherwood Park were below the air quality guidelines. Maximum 1-hour average concentrations were:
  - 10% of the 1-hour guideline for CO;
  - 40% of the 1-hour guideline for O_3;
  - 17% of the 1-hour guideline for NO_2;
  - 0% of the 1-hour guideline for H_2S; and
  - 6% of the 1-hour guideline for SO_2.
- Carbon monoxide, oxides of nitrogen and hydrocarbon levels were highest at the northwest, southwest and northcentral Sherwood Park sites. The major source of these pollutants are vehicle exhaust emissions from traffic arteries in the community (e.g. Baseline Road and Wye Road). Concentrations of these chemicals were close to those recorded at other small urban centres in Alberta.
- Overall average H_2S and SO_2 concentrations were very low at all monitoring sites in Sherwood Park.

Carbon Monoxide (CO)

Max. 1-hour Average	1-hour Guideline
1.3 ppm	13 ppm

Carbon monoxide is a colourless, odourless gas emitted into the atmosphere primarily by motor vehicles. Minor sources include fireplaces, industry, aircraft and natural gas combustion.

The highest 1-hour average CO concentration was recorded at the southwest site in the late evening on September 6. This maximum value is 10% of the 1-hour guideline. CO levels were generally higher at the northwest and southwest sites. The overall average CO value for the entire fall monitoring period was 50% of that observed in downtown Edmonton for the same time period. Average CO concentrations were close to those measured at the Edmonton east and Fort Saskatchewan monitoring stations.

Ozone (O_3)

Max. 1-hour Average	1-hour Guideline
0.033 ppm	0.082 ppm

Ozone in the lower atmosphere is produced by: (1) the reaction of oxides of nitrogen and volatile organic compounds in the presence of sunlight; and (2) transport of O_3 from the upper atmosphere to ground level. Transport of O_3 from the upper atmosphere accounts for most of the background O_3 during the fall season. O_3 concentrations are generally lower in urban centres due to the destruction of O_3 by nitric oxide.

The maximum 1-hour average O_3 concentration was measured in the early afternoon on October 18 at the east monitoring site. O_3 values followed the typical daily variation observed at other Alberta locations (minimum values in the early morning and maximum values between noon and 4:00 pm). The exception to this daily variation was on October 28 when O_3

values dropped substantially in the late afternoon after the passage of a cold front coupled with strong northwest winds. Overall average O_3 values were lowest at the central site and highest at the northcentral site. O_3 levels measured in Sherwood Park were close to those recorded in Fort Saskatchewan and Fort McMurray for the same time period. O_3 concentrations are generally the lowest during the fall season.

Hydrocarbons (THC, RHC and CH_4)

Max. 1-hour Average	1-hour Guideline
THC = 2.8 ppm	no guideline
RHC = 0.8 ppm	no guideline
CH_4 = 2.2 ppm	no guideline

The term "total hydrocarbons" (THC) refers to a broad family of chemicals that contain carbon and hydrogen atoms. Methane (CH_4), a non-reactive hydrocarbon, is the most common hydrocarbon in the earth's atmosphere. Reactive hydrocarbons (RHC) such as alkenes, alkynes and aromatics are important because they can: (1) react with oxides of nitrogen in the presence of sunlight to form ozone; and (2) be toxic to humans, animals or vegetation. Sources of hydrocarbons include vegetation, vehicular emissions, gasoline marketing and storage tanks, petroleum and chemical industries, dry cleaning, fireplaces, natural gas combustion and aircraft traffic.

Maximum 1-hour average THC and RHC values were recorded at the northcentral site on the morning of October 22. Hydrocarbon concentrations were generally higher at the northcentral, northwest and southwest sites. The major source of hydrocarbons at these locations is vehicle exhaust emissions. RHC made up about 10% of THC based on average concentrations. Overall average THC values were similar to those measured at other small urban locations in Alberta for the same time period. Normal background THC concentrations are between 1.5 and 2.0 ppm.

Oxides of Nitrogen (NO_2, NO, NO_x)

Max. 1-hour Average	1-hour Guideline
NO_2 = 0.035 ppm	0.210 ppm
NO = 0.139 ppm	no guideline
NO_x = 0.175 ppm	no guideline

Oxides of nitrogen (NO_x) are the sum of nitrogen dioxide (NO_2) and nitric oxide (NO). During high temperature combustion, as in the burning of natural gas, coal, oil and gasoline, atmospheric nitrogen may combine with molecular oxygen to form NO. NO is colourless, odourless and has no known toxic effects. Most NO is rapidly oxidized to form NO_2. NO_2 is a reddish-brown gas with a pungent odour.

The maximum 1-hour average NO_2, NO and NO_x concentrations were recorded at the northwest monitoring site on the morning of October 22. Higher values of oxides of nitrogen are generally observed at the northcentral, northwest and southwest sites. Again, higher values at these locations are due to vehicle exhaust emissions from major traffic arteries in Sherwood Park. Average NO_2 concentrations were similar to those recorded at the Edmonton east and Fort Saskatchewan monitoring stations.

Hydrogen Sulphide (H_2S)

Max. 1-hour Average	1-hour Guideline
H_2S = 0.000 ppm	0.010 ppm

Hydrogen sulphide (H_2S) is a colourless gas with a rotten egg odour. Industrial sources of H_2S include fugitive emissions (leakages) from petroleum refineries, tank farms for unrefined petroleum products, natural gas plants, petrochemical plants, oil sands plants, sewage treatment facilities, pulp and paper plants which use the kraft pulping process, and animal feedlots. Natural sources of H_2S include sulphur hot springs, sloughs, swamps and lakes.

Based on 1-hour average concentrations, H_2S values were lower than the detection limit of the monitoring instrument at all sites on all survey days. H_2S concentrations were also below the detection limit at other Alberta stations on the four fall survey days.

Sulphur Dioxide (SO_2)

Max. 1-hour Average	1-hour Guideline
SO_2 = 0.011 ppm	0.170 ppm

Sulphur dioxide (SO_2) is a colourless gas with a pungent odour. In Alberta, the major sources of SO_2 are natural gas processing plants, oil sands facilities, and power plants. Other sources include gas plant flares, oil refineries, pulp and paper mills and fertilizer plants.

The maximum 1-hour average SO_2 concentration was measured at the southwest site in the early afternoon on October 22. This value is 6% of the 1-hour guideline for SO_2. Overall average SO_2 values were highest at the southwest and east monitoring sites. The average SO_2 concentration for all fall survey days was the same as those measured at the Edmonton east and Fort McMurray stations and less then the average for the same time period in Fort Saskatchewan.

Average Concentrations at Each Monitoring Site in Sherwood Park (ppm)

September 06, 1996

Monitoring Site	Monitoring Period	CO	O_3	NO_x	NO_2	NO	THC	CH_4	RHC	H_2S	SO_2	Temp.°	Wind dir/spd*	Cloud*
east	09:41 to 10:44	no data	0.018	0.001	0.002	0.000	2.3	1.8	0.4	0.000	0.005	7	W-WNW/15-25	50%
northcentral	10:53 to 11:58	no data	0.023	0.001	0.001	0.000	2.1	1.8	0.2	0.000	0.002	n/a	WSW-WNW/15	25-50%
northwest	12:15 to 13:16	no data	0.021	0.008	0.003	0.001	2.2	1.9	0.3	0.000	0.003	n/a	n/a	100%
southwest	13:25 to 14:27	no data	0.022	0.004	0.003	0.000	2.1	1.9	0.2	0.000	0.000	10	W-WNW/15	25-50%
central	14:36 to 15:34	no data	0.025	0.010	0.003	0.002	2.2	1.9	0.2	0.000	0.000	n/a	W/15	25-50%
east	15:47 to 16:48	no data	0.024	0.011	0.002	0.004	2.1	1.8	0.3	0.000	0.003	n/a	W/15	25-50%
northcentral	16:58 to 17:58	0.6	0.020	0.010	0.003	0.002	2.1	1.8	0.2	0.000	0.000	n/a	WNW/5-7	25-50%
northwest	18:07 to 19:29	1.1	0.009	0.019	0.009	0.003	2.3	1.8	0.4	0.000	0.000	n/a	n/a	n/a
southwest	19:38 to 20:48	1.3	0.007	0.027	0.011	0.009	2.3	1.8	0.4	0.000	0.001	n/a	n/a	n/a
central	20:57 to 21:55	0.7	0.012	0.010	0.001	0.005	2.1	1.8	0.3	0.000	0.000	n/a	E/5-7	n/a

October 18, 1996

Monitoring Site	Monitoring Period	CO	O_3	NO_x	NO_2	NO	THC	CH_4	RHC	H_2S	SO_2	Temp.°	Wind dir/spd*	Cloud*
southwest	07:25 to 08:31	0.1	0.024	0.008	0.008	0.000	2.3	2.0	0.2	0.000	0.000	0	E/7	80%
northwest	08:39 to 09:49	0.3	0.027	0.012	0.011	0.001	2.2	2.0	0.2	0.000	0.000	n/a	SE/14	n/a
northcentral	09:57 to 10:59	0.2	0.028	0.006	0.004	0.002	2.2	2.0	0.2	0.000	0.000	2	SE/11-14	60%
central	11:08 to 12:09	0.2	0.028	0.012	0.010	0.001	2.2	1.9	0.1	0.000	0.000	2	SE/0-7	n/a
east	12:20 to 13:24	0.4	0.033	0.013	0.008	0.005	2.2	1.9	0.2	0.000	0.000	3	SE/0-4	100%
southwest	13:38 to 14:45	0.1	0.018	0.041	0.022	0.018	2.3	2.0	0.2	0.000	0.002	4	NW/0-4	90%
northwest	15:06 to 16:10	0.2	0.023	0.014	0.012	0.002	2.2	1.9	0.1	0.000	0.001	3	NE/14	75%
northcentral	16:17 to 17:20	0.5	0.019	0.028	0.013	0.014	2.2	2.0	0.1	0.000	0.001	5	calm	65%
central	17:28 to 18:46	0.1	0.014	0.020	0.014	0.005	2.2	2.0	0.2	0.000	0.000	1	N/7	90%
east	18:58 to 19:58	0.2	0.014	0.027	0.015	0.011	2.2	1.9	0.2	0.000	0.000	-2	NW/11	100%

October 22, 1996

Monitoring Site	Monitoring Period	CO	O_3	NO_x	NO_2	NO	THC	CH_4	RHC	H_2S	SO_2	Temp.°	Wind dir/spd*	Cloud*
southwest	7:31 to 8:30	1.0	0.001	0.074	0.024	0.049	2.3	2.2	0.1	0.000	0.000	1	calm	100%
northwest	8:39 to 9:39	0.1	0.001	0.175	0.035	0.139	2.2	2.2	0.2	0.000	0.000	2	calm	100%
northcentral	9:53 to 10:59	0.3	0.003	0.114	0.035	0.079	2.8	2.2	0.8	0.000	0.001	5	calm	100%
central	11:06 to 12:07	0.0	0.004	0.078	0.034	0.042	1.9	2.1	0.0	0.000	0.002	5	calm	100%
east	12:19 to 13:19	0.0	0.007	0.073	0.034	0.037	1.8	2.1	0.0	0.000	0.002	6	W/7	65%
southwest	13:31 to 14:50	0.0	0.022	0.039	0.032	0.011	1.5	1.9	0.0	0.000	0.011	8	W/0-4	60%
northwest	14:59 to 16:00	0.0	0.023	0.034	0.030	0.007	1.5	1.9	0.0	0.000	0.004	10	NW/0-11	65%
northcentral	16:10 to 17:09	0.0	0.015	0.032	0.027	0.004	1.5	1.9	0.0	0.000	0.000	8	NW/0-3	70%
central	17:19 to 18:18	0.0	0.012	0.035	0.029	0.006	1.5	1.9	0.0	0.000	0.006	6	NW/11	90%
east	18:50 to 19:50	0.0	0.012	0.035	0.024	0.010	1.5	1.9	0.0	0.000	0.007	4	NW/14	100%

October 28, 1996

Monitoring Site	Monitoring Period	CO	O_3	NO_x	NO_2	NO	THC	CH_4	RHC	H_2S	SO_2	Temp.°	Wind dir/spd*	Cloud*
northcentral	09:47 to 10:58	0.2	0.019	0.032	0.022	0.009	2.1	1.9	0.1	0.000	0.000	4	SSE/0-7	95%
northwest	11:07 to 12:06	0.2	0.015	0.030	0.019	0.010	2.2	1.9	0.2	0.000	0.000	3	S/0-7	95%
northcentral	12:16 to 13:11	0.5	0.009	0.044	0.022	0.021	2.3	2.0	0.1	0.000	0.000	3	WNW/14	95%
southwest	13:22 to 15:18	0.2	0.013	0.023	0.013	0.008	2.1	1.9	0.1	0.000	0.002	3	NW/9	100%
northwest	15:30 to 16:30	0.4	0.004	0.059	0.015	0.042	2.1	1.9	0.2	0.000	0.000	-2	NNW/18	100%

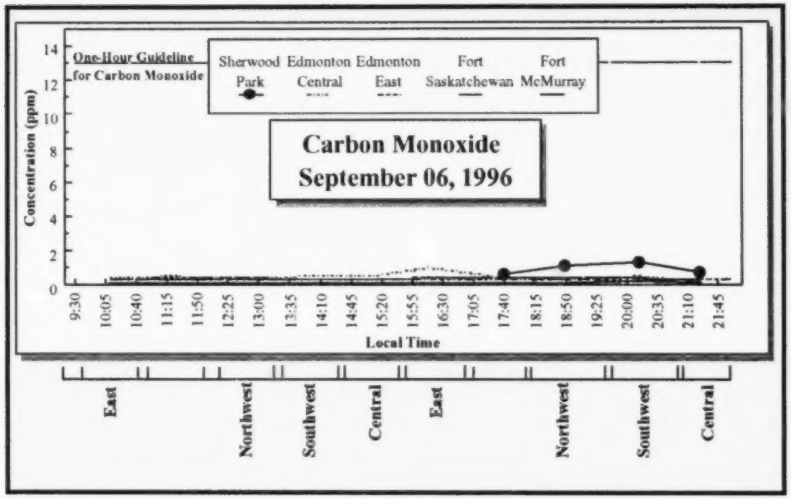
Average Concentrations at Each Monitoring Site in Sherwood Park (ppm)										
Monitoring Site	**CO**	**O_3**	**NO_x**	**NO_2**	**NO**	**THC**	**CH_4**	**RHC**	**H_2S**	**SO_2**
southwest	0.5	0.015	0.031	0.016	0.014	2.1	2.0	0.2	0.000	0.002
northwest	0.4	0.015	0.032	0.015	0.015	2.1	1.9	0.2	0.000	0.001
northcentral	0.3	0.017	0.033	0.016	0.016	2.2	2.0	0.2	0.000	0.001
central	0.2	0.014	0.024	0.013	0.009	1.7	1.7	0.1	0.000	0.001
east	0.1	0.015	0.023	0.012	0.010	1.7	1.6	0.1	0.000	0.002

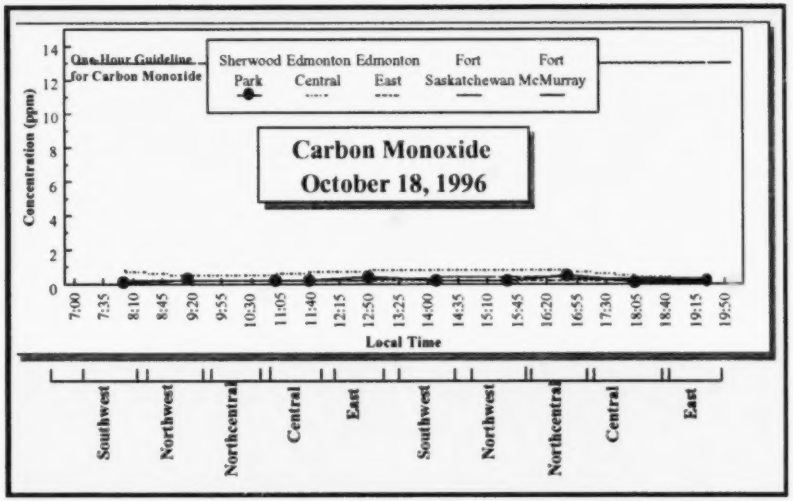
Overall Average Concentrations on All Fall Survey Days (ppm)										
Location	**CO**	**O_3**	**NO_x**	**NO_2**	**NO**	**THC**	**CH_4**	**RHC**	**H_2S**	**SO_2**
Sherwood Park	0.4	0.016	0.034	0.016	0.016	2.1	1.9	0.2	0.000	0.001
Edmonton Centra	0.8	0.009	0.067	0.026	0.042	2.2	no data	no data	no data	no data
Edmonton East	0.5	0.013	0.044	0.018	0.027	2.2	no data	no data	0.000	0.001
Fort Saskatchewar	0.5	0.019	0.024	0.011	0.013	2.0	no data	no data	0.000	0.002
Fort McMurray	0.1	0.017	0.004	0.004	0.001	2.3	no data	no data	0.000	0.001
Royal Park	no data	0.027	0.002	0.002	0.001	no data	no data	no data	no data	no data

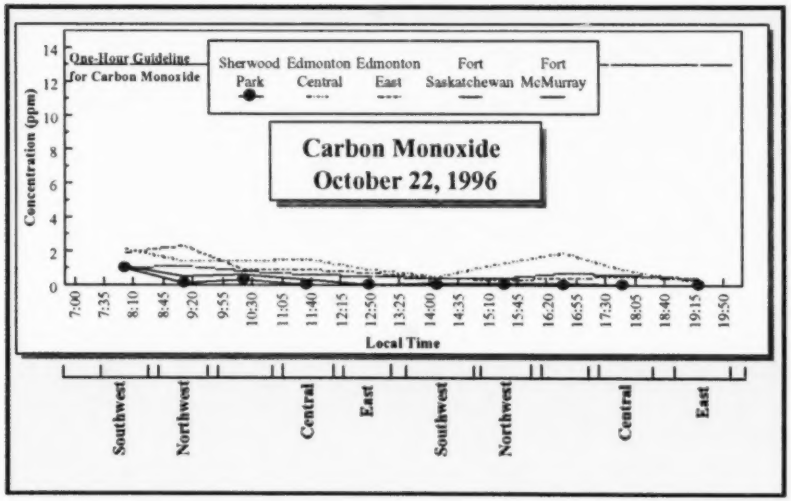
- Weather conditions are based on observations at the monitoring site. Units are temperature [°C], wind speed [km/h] and cloud cover [% of sky coverage].

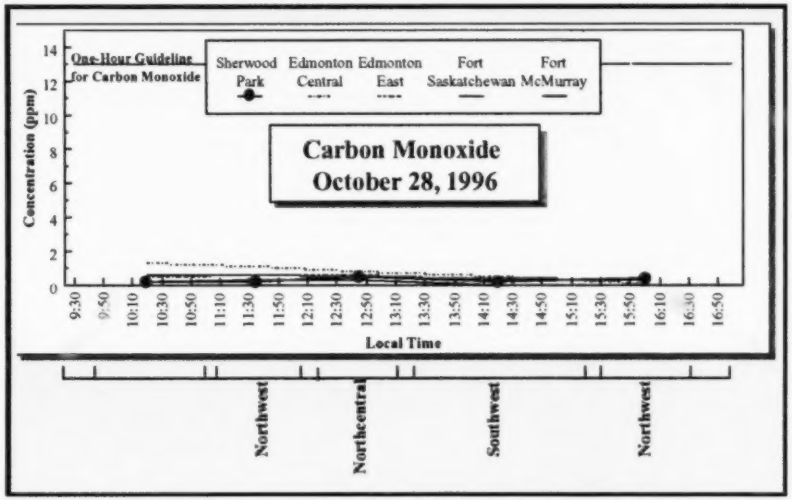
Fall, 1996

Average Carbon Monoxide Concentrations in Sherwood Park



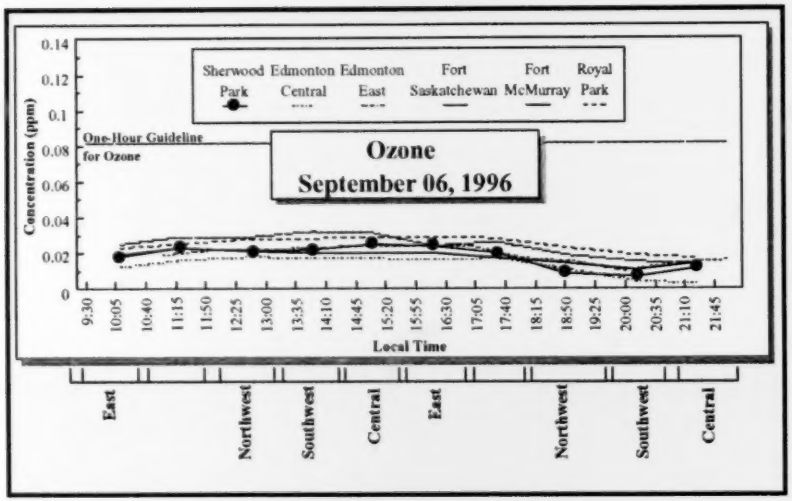


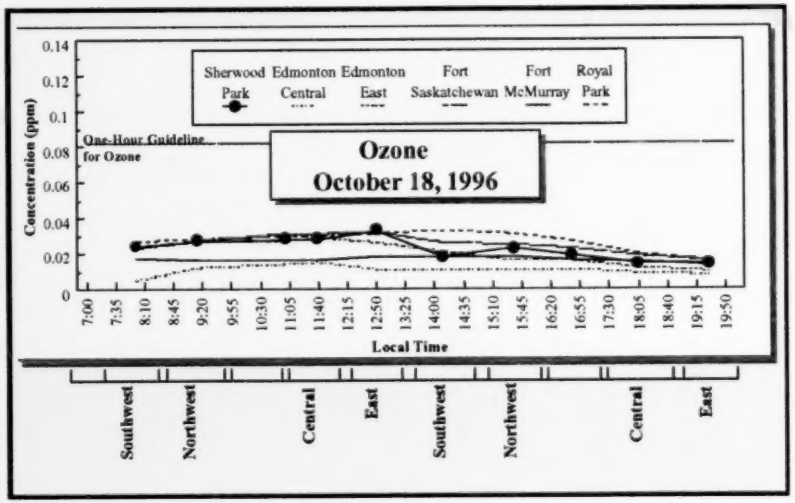


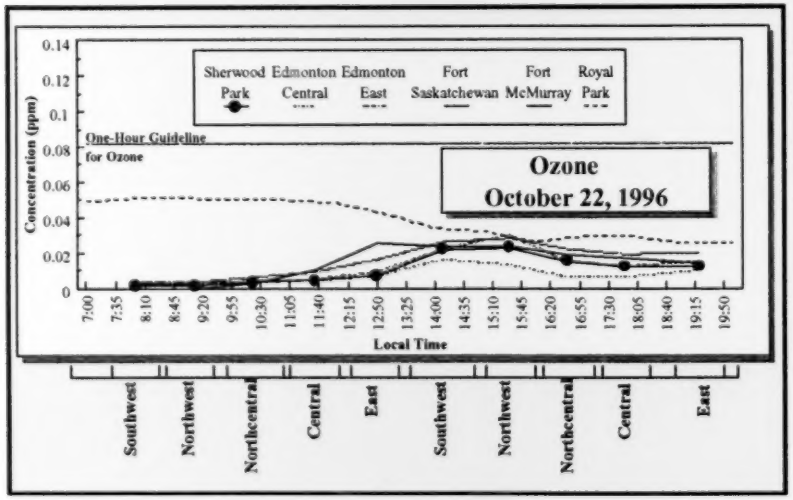


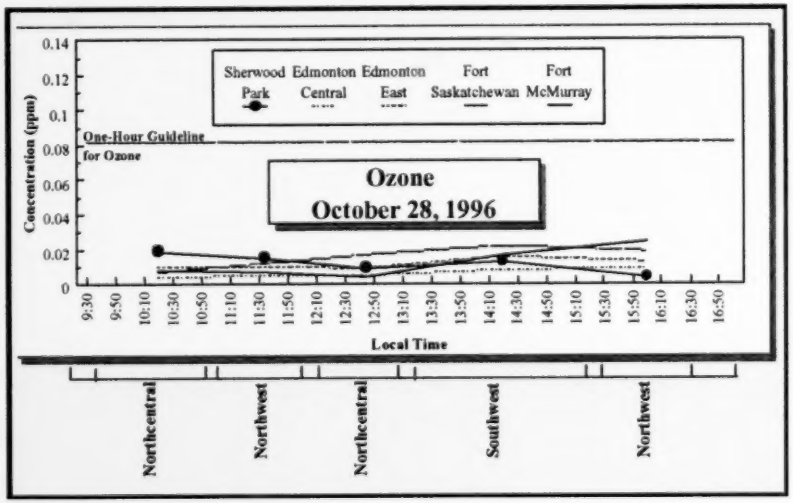
Fall, 1996

Average Ozone Concentrations in Sherwood Park



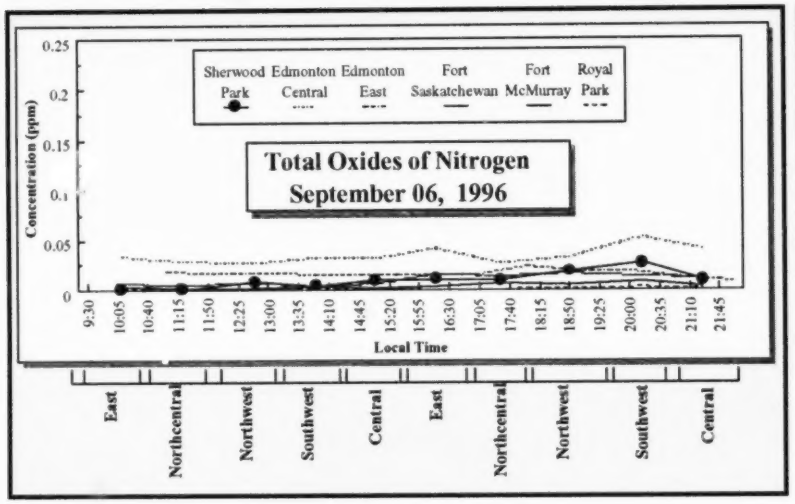


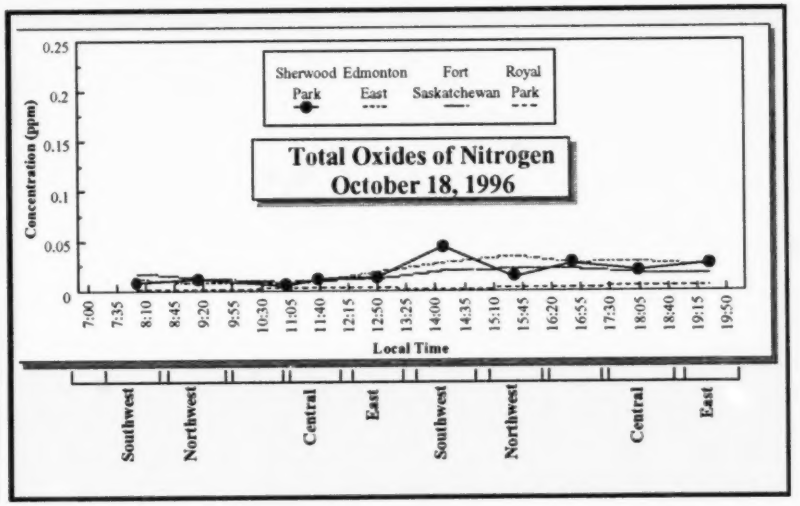


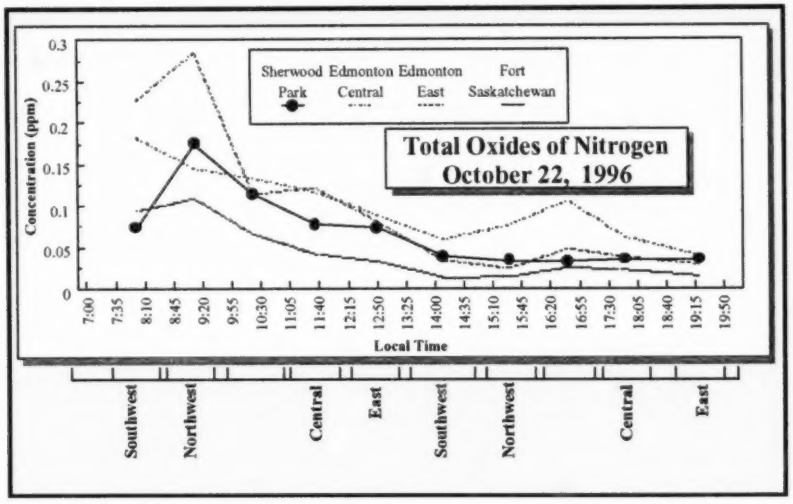


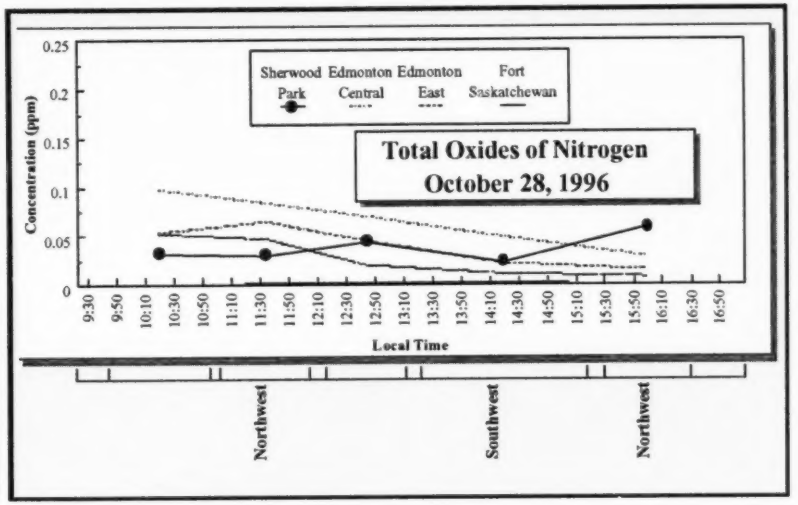
Fall, 1996

Average Total Oxides of Nitrogen Concentrations in Sherwood Park



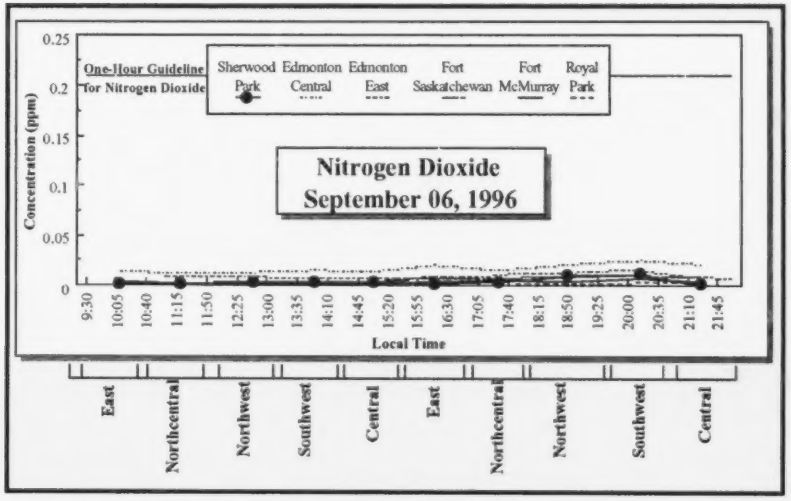


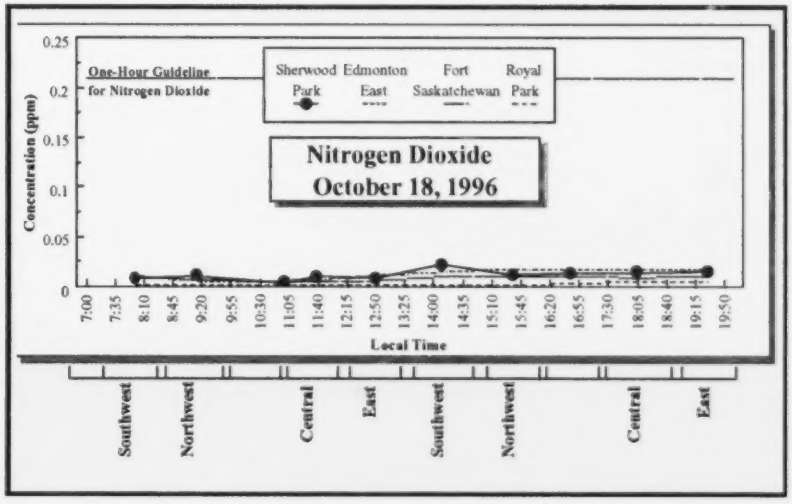


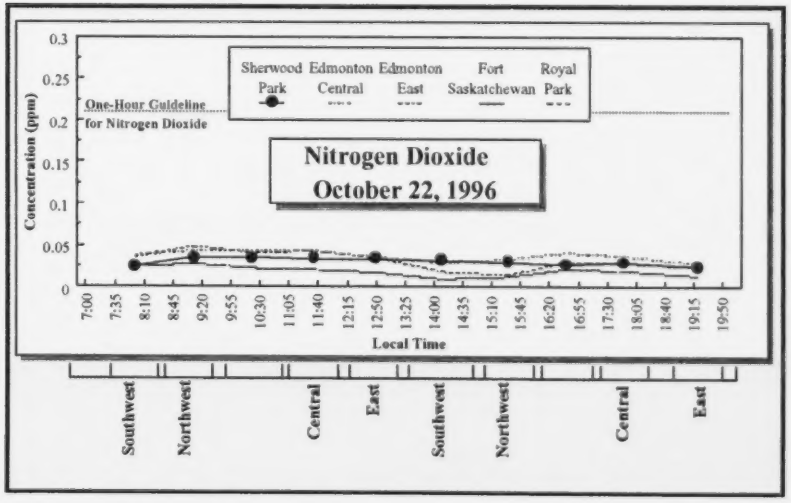


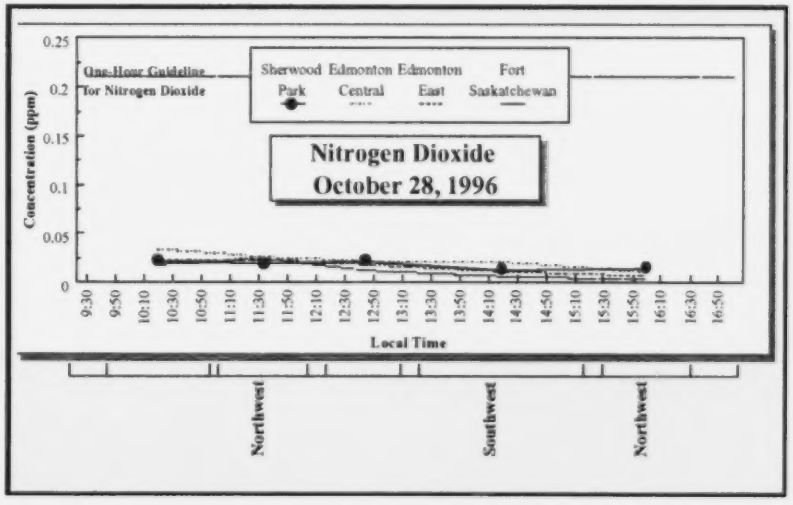
Fall, 1996

Average Nitrogen Dioxide Concentrations in Sherwood Park



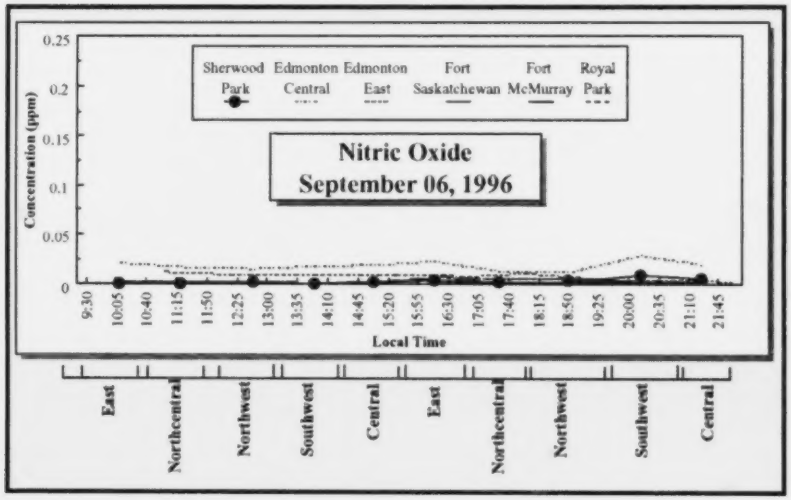


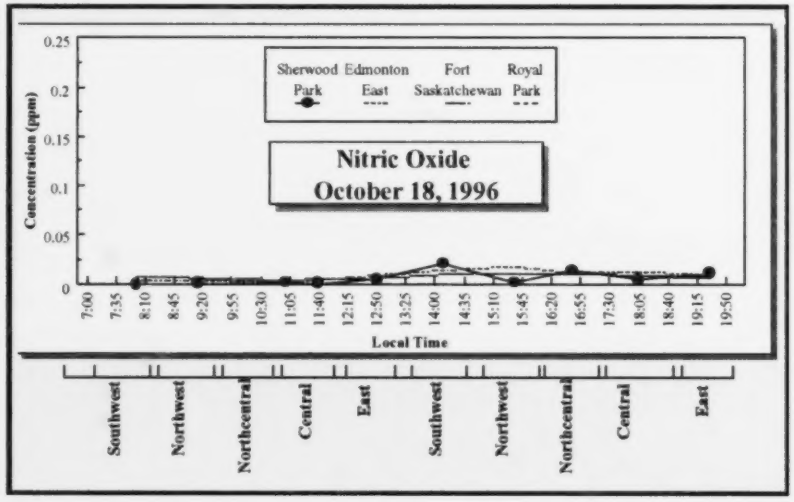


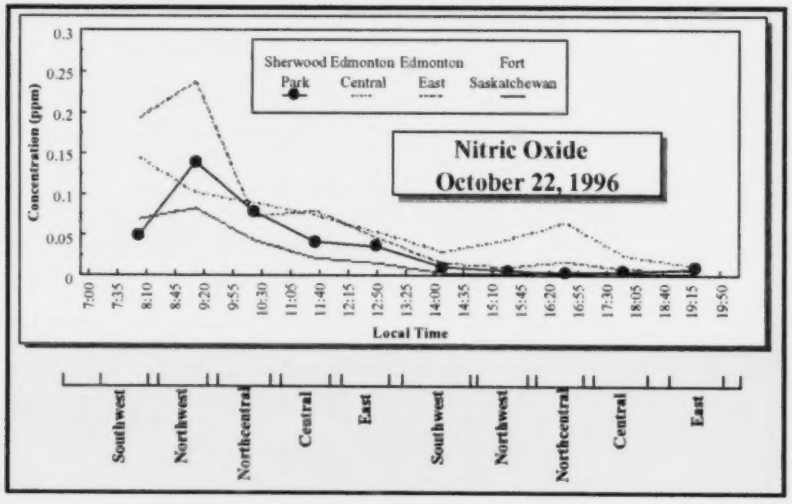


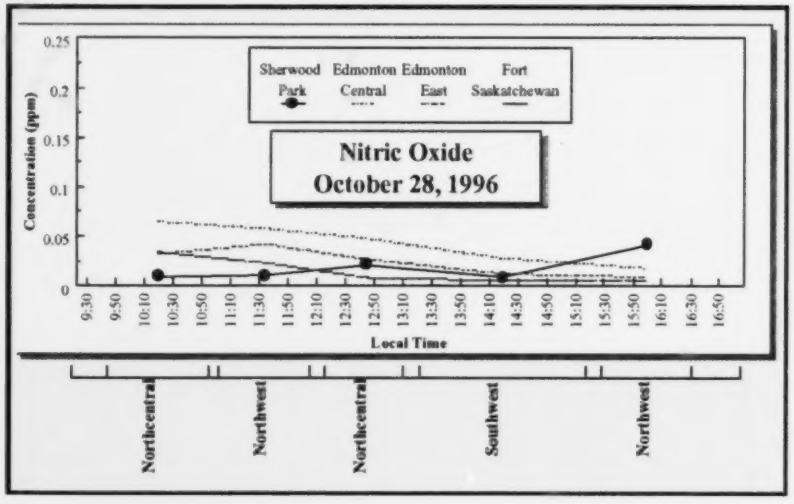
Fall, 1996

Average Nitric Oxide Concentrations in Sherwood Park



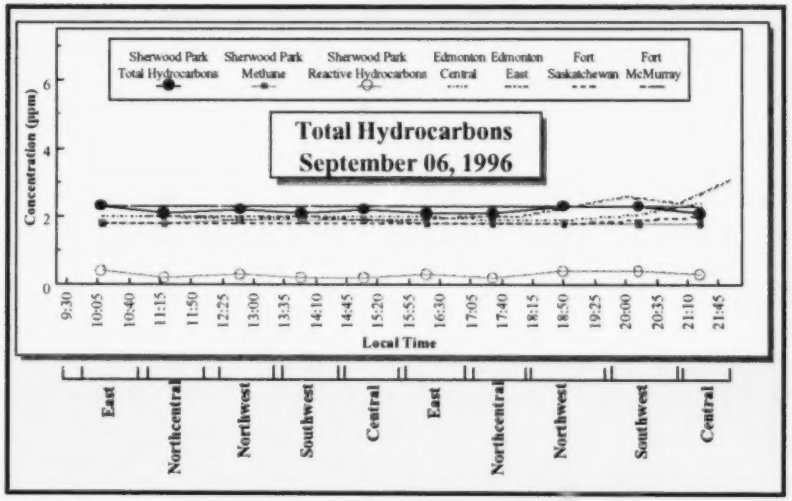


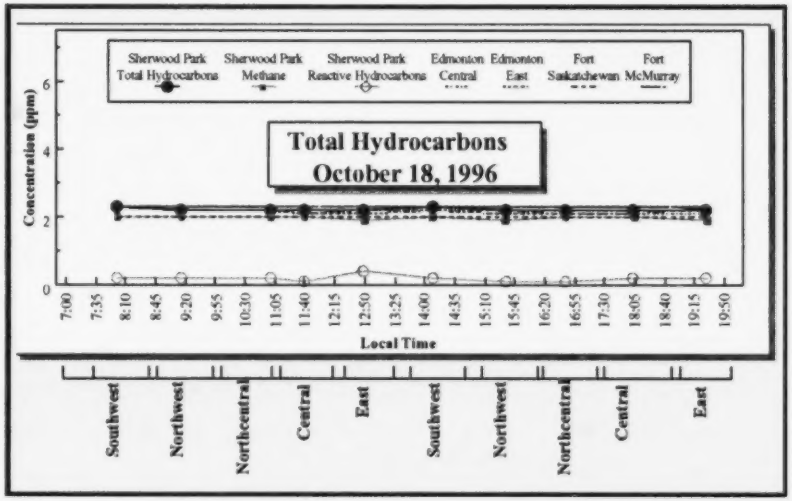


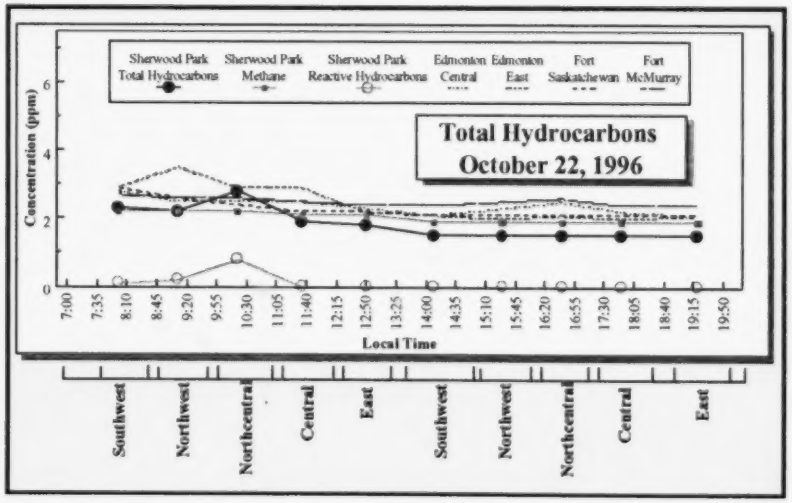


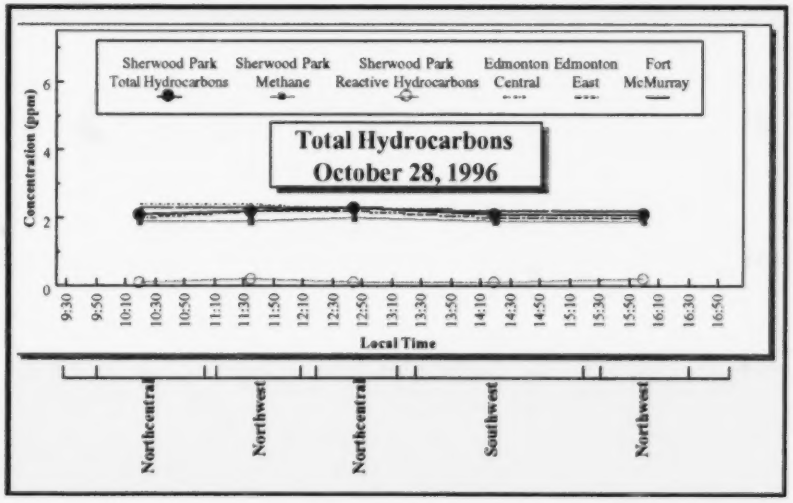
Fall, 1996

Average Total Hydrocarbon Concentrations in Sherwood Park



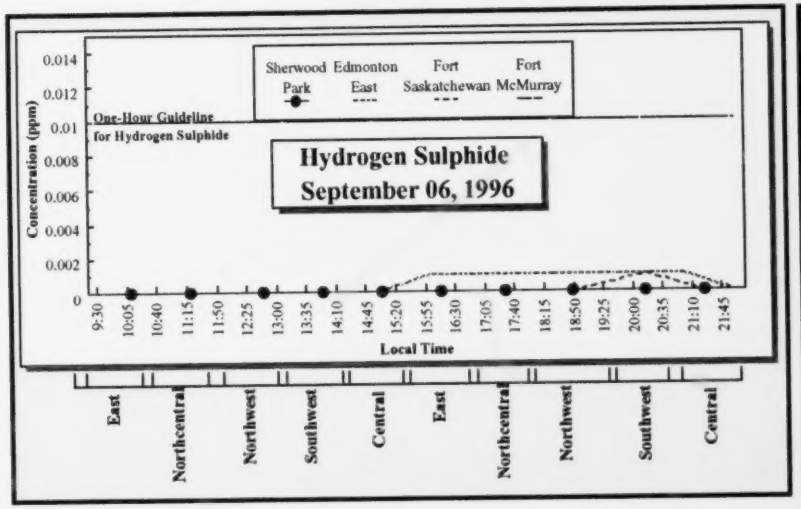


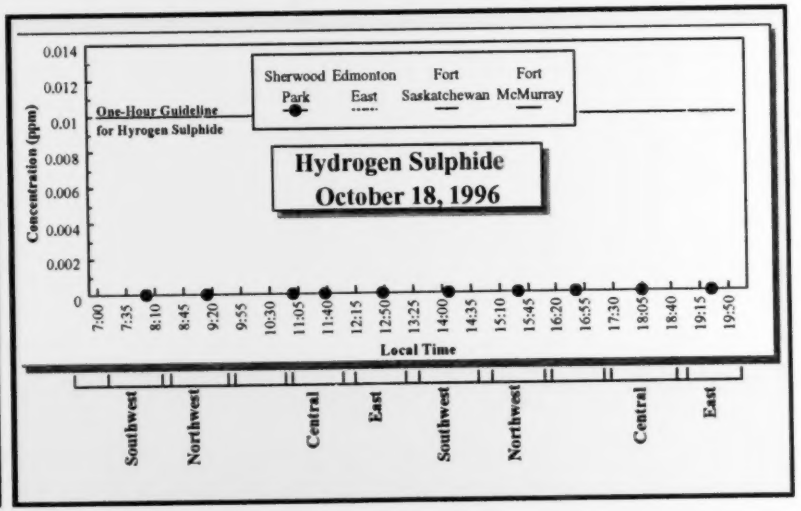


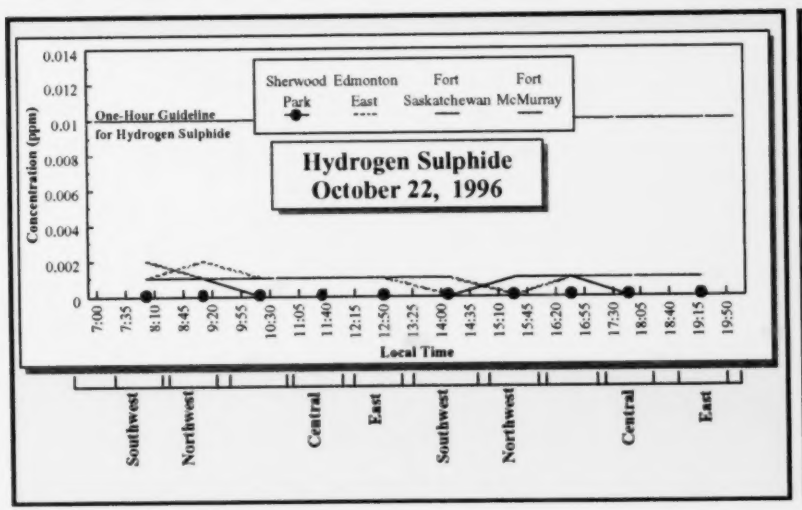


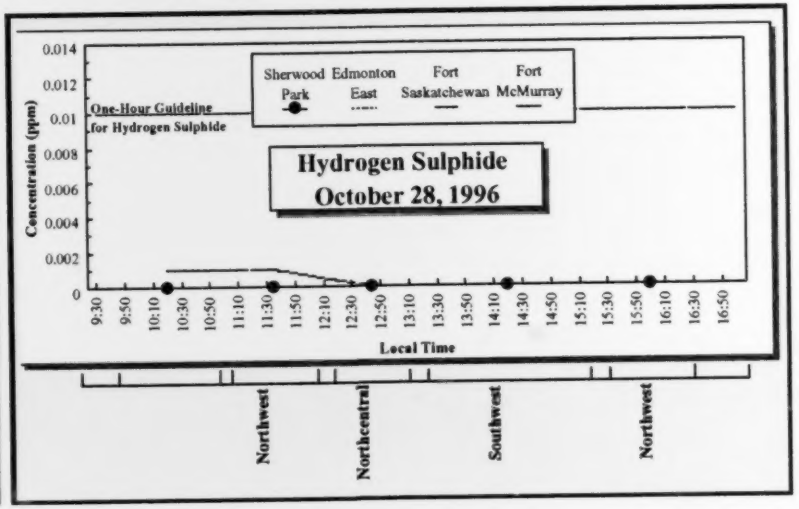
Fall, 1996

Average Hydrogen Sulphide Concentrations in Sherwood Park









Fall, 1996

Average Sulphur Dioxide Concentrations in Sherwood Park